INDOOR AIR QUALITY ASSESSMENT

Lakeview Junior High School
1570 Lakeview Avenue
Dracut, Massachusetts

Prepared by:
Massachusetts Department of Public Health
Center for Environmental Health
Bureau of Environmental Health Assessment
Emergency Response/Indoor Air Quality Program

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Background/Introduction

At the request of Elaine Espindle, Superintendent, Dracut Public Schools, the Department of Public Health (DPH), Center for Environmental Health (CEH), Bureau of Environmental Health Assessment (BEHA) was contacted on the afternoon of March 31, 2004 to provide assistance and consultation regarding a rash outbreak among students at the Lakeview Junior High School (LJHS), 1570 Lakeview Avenue, Dracut, Massachusetts. Concerns about a possible link between indoor environmental conditions in the building and skin rashes prompted Ms. Espindle's request for assistance. The evaluation was conducted to determine whether potential indoor air quality problems existed in the building and if so, whether a connection with the reported symptoms could be determined.

The school is a multi-level brick building originally constructed in 2001. The upper levels of the school contain general classrooms and the school library. The lower level consists of the gymnasium, cafeteria, teachers' lunchroom, administrative offices, nurse's office and conference rooms. Portions of the first floor (rooms 127 though 131) are used as the Dracut Public Library. Windows are openable in classrooms throughout the building.

Methods

BEHA staff performed air testing for a number of IAQ parameters, as well as a visual inspection of building materials for water damage and/or microbial growth and other potential irritants. On April 1, 2004, air tests for carbon monoxide, carbon dioxide, temperature, relative humidity and airborne particulate matter with a diameter less than

2.5 micrometers were conducted in a limited number of areas. On April 2, 2004, air tests for carbon monoxide, carbon dioxide, temperature, relative humidity, volatile organic compounds, airborne particle matter with a diameter less than 2.5 micrometers and ultrafine particulates were conducted in all accessible areas of the building. Air tests for carbon monoxide, carbon dioxide, temperature, relative humidity were conducted with the TSI, Q-Trak, IAQ Monitor, Model 8551. Air tests for airborne particle matter with a diameter less than 2.5 micrometers were taken with the TSI, DUSTTRAK™ Aerosol Monitor Model 8520. Screening for total volatile organic compounds (TVOCs) was conducted using a Thermo Environmental Instruments Inc., Model 580 Series Photo Ionization Detector (PID). Air tests for UFPs were taken with the TSI, P-Trak ™ Ultrafine Particle Counter Model 8525.

Results

The LJHS houses approximately 700 students in grades 7 and 8 with a staff of over 50. Only administrative and custodial staff were present at the time of the assessment. Tests were taken while classroom areas were vacant. Air sampling results for general ventilation parameters (carbon dioxide, temperature and relative humidity) are not reflective of a fully occupied building. Results for April 1 and April 2, 2004 appear in Table 1 and 2, respectively.

School officials reported that the rash was initially confined to the upper portions of the chest and notably the exposed areas (e.g., neck area). Students presenting with the rash did not report any irritant symptoms of the eyes, nose, throat or respiratory system. The rash was first reported on March 29, 2004 in a small number of individuals (<5).

Following this, all students were asked to report any such rashes to the nurse's office. On March 30, 2004, over 40 students reported rash symptoms. School officials subsequently closed the school for cleaning and testing by a private consultant (Covino Environmental Associates, Inc.). Following extensive remedial efforts, the LJHS reopened on April 1, 2004. Within minutes of entering the school, students began reporting rash symptoms. The school also contracted with Dr. William Patterson, an environmental health physician to work with local health/school nurses on the evaluation of student symptoms. More than 150 students reported rash symptoms to school officials by noon, April 1, 2004. The LJHS was again closed by school officials for further cleaning. On April 1 and April 2, 2004, visits to conduct indoor air quality assessments were made at the LJHS by Michael Feeney, Director of Emergency Response/Indoor Air Quality (ER/IAQ), BEHA. School reopened on April 5, 2004, with a reported reduction in student visits to the medical office (<80). By April 8, 2004, a small number of students reported to the medical office with continued rash symptoms (<10).

Discussion

Ventilation

Standard operating procedures could not be employed to evaluate indoor air quality with the building unoccupied. Air sampling was conducted for general ventilation parameters in order to ascertain whether mechanical ventilation systems were exchanging air; however, the ability of the ventilation system to provide for the comfort of building occupants could not be evaluated under these conditions. Carbon dioxide measurements were below 500 parts per million (ppm), which would be expected for an unoccupied building. Note: the building was vacant for at least 18 hours prior to testing with its ventilation system operating.

Fresh air in classrooms throughout the building is provided by unit ventilators (univents) (Picture 1). Univents draw air from outdoors through a fresh air intake located on the exterior walls of the building and return air through an air intake located at the base of each unit (Figure 1). The mixture of fresh and return air is drawn through a filter and heating coil and is then provided to the classroom via motorized fans through an air diffuser on the top of the unit. Univents were operating in all areas surveyed.

The mechanical exhaust ventilation system consists of ceiling mounted exhaust vents. These vents were operating throughout the building. The location of some exhaust vents can limit exhaust efficiency. Some exhaust vents were located above or near doorways. When a classroom door is open, exhaust vents would tend to draw air from both the hallway and the classroom. The open hallway door reduces the effectiveness of the exhaust vent to remove common environmental pollutants from classrooms.

To maximize air exchange, the BEHA recommends that both supply and exhaust ventilation operate continuously during periods of school occupancy. In order to have proper ventilation with a mechanical supply and exhaust system, the systems must be balanced to provide an adequate amount of fresh air to the interior of a room while removing stale air from the room. It is recommended that HVAC systems be re-balanced every five years to ensure adequate air systems function (SMACNA, 1994). Since the school opened in 2001, the ventilation system should have been balanced prior to occupancy.

Temperatures ranged between 67°F to 70°F on April 1, 2004 and 67°F to 69°F on April 2, 2004, which were below the BEHA comfort guideline in a number of areas, which again would be expected in an unoccupied building. Temperatures would be expected to rise when the school is fully occupied. The BEHA recommends that indoor air temperatures be maintained in a range of 70° F to 78° F in order to provide for the comfort of building occupants. In many cases concerning indoor air quality, fluctuations of temperature in occupied spaces are typically experienced, even in a building with an adequate fresh air supply.

Relative humidity within the building ranged from 33 to 35 percent on April 1, 2004 and from 29 to 37 percent on April 2, 2004, which were also below the BEHA recommended comfort range on both days. As with the temperature, relative humidity levels in the building would be expected to rise with occupancy. The BEHA recommends a comfort range of 40 to 60 percent for indoor air relative humidity. Relative humidity levels in the building would be expected to drop during the winter months due to heating. The sensation of dryness and irritation is common in a low relative humidity environment. Low relative humidity is a common problem during the heating season in the northeast part of the United States.

Microbial/Moisture Concerns

In order to ascertain whether microbial contamination was present within the building, BEHA staff examined the second floor areas where the rash outbreak was initially reported. The ceiling plenum above rooms 210, 211, 214, 215 and 216 and the hallway between these classrooms was examined. The roof, decking, ceiling plenum and suspended ceiling tiles were dry and free of visible microbial contamination, despite a rainstorm that occurred 48 hours prior to the inspection that produced nearly 5 inches of rain in the Dracut, Massachusetts area (The Weather Underground, 2004). Extensive ceiling tile damage was noted in the hallway outside the cafeteria/gymnasium hallway (Picture 2), which was discovered on April 2, 2004. Damage to the ceiling tiles occurred overnight after BEHA staff left the building on April 1, 2004. The duration in which the cafeteria hallway ceiling tiles were moistened is not expected to be an adequate amount of time for mold to colonize the ceiling tiles. The US Environmental Protection Agency (US EPA) and the American Conference of Governmental Industrial Hygienists (ACGIH) recommends that porous materials be dried with fans and heating within 24 to 48 hours of becoming wet (US EPA, 2001; ACGIH, 1989). If porous materials are not dried within this time frame, mold growth may occur. Water-damaged porous materials cannot be adequately cleaned to remove mold growth. The application of a mildewcide to moldy porous materials is not recommended. Since these materials were not moistened prior to the reports of dermal irritation and were in a location away from the initial reports of skin symptoms, it is not likely that this damage is related to the rashes exhibited by students.

BEHA staff examined the interior of unit ventilators (univents) in rooms 210, 211, 214, and 215 to determine whether water had accumulated within the cabinet or if insulation had deteriorated, producing fiberglass particles. The univent interiors were dry and insulation around the univent cabinets was intact and free of wear.

Air Testing for Possible Irritants

Air testing was conducted for the following materials in order to ascertain whether an unusual source of irritants existed within the building: VOCs, carbon monoxide, particle matter with a diameter of 2.5 micrometers or less and ultrafine particulates.

Volatile Organic Compounds (VOCs)

Indoor air quality can be negatively influenced by the presence of materials containing VOCs. VOCs are carbon-containing substances that have the ability to evaporate at room temperature. Frequently, exposure to low levels of total VOCs (TVOCs) may produce eye, nose, throat and/or respiratory irritation in some sensitive individuals. For example, chemicals evaporating from a paint can stored at room temperature would most likely contain VOCs. In an effort to determine whether VOCs were present in the building, air monitoring for TVOCs was conducted during the April 2, 2004 visit. An outdoor air sample was taken for comparison. Outdoor TVOC concentrations were non-detectable or ND (Table 2). Measurable levels of TVOCs were detected in the building after the floor was mopped with a petroleum based dust mop head treatment (Picture 3). These areas were retested several hours after the mopping and readings were ND. Therefore, it is also unlikely that the mop treatment was the source of the rash outbreak, particularly since it has been used in the school since the beginning to the school year without incident.

Carbon Monoxide

The process of combustion produces a number of pollutants. Common combustion emissions include carbon monoxide, carbon dioxide, water vapor and smoke (fine airborne particulate matter). Carbon monoxide is a by-product of incomplete combustion of organic matter (e.g., natural gas, gasoline, wood and tobacco). Exposure to carbon monoxide can produce immediate and acute health affects.

Several air quality standards have been established to address carbon monoxide and prevent symptoms from exposure. The MDPH established a corrective action level concerning carbon monoxide in ice skating rinks that use fossil-fueled ice resurfacing equipment. If an operator of an indoor ice rink measures a carbon monoxide level over 30 ppm, taken 20 minutes after resurfacing within a rink, that operator must take actions to reduce carbon monoxide levels (MDPH, 1997).

ASHRAE has adopted the National Ambient-Air Quality Standards (NAAQS) as one set of criteria for assessing indoor air quality and monitoring of fresh air introduced by HVAC systems (ASHRAE, 1989). The NAAQS are standards established by the US EPA to protect the public health from six criteria pollutants, including carbon monoxide and particulate matter (US EPA, 2000). As recommended by ASHRAE, pollutant levels of fresh air introduced to a building should not exceed the NAAQS (ASHRAE, 1989). The NAAQS were adopted by reference in the Building Officials & Code Administrators (BOCA) National Mechanical Code of 1993 (BOCA, 1993), which is now an HVAC standard included in the Massachusetts State Building Code (SBBRS, 1997). According to the NAAQS, carbon monoxide levels in the outdoor air should not exceed 9 ppm in an eight-hour average (US EPA, 2000).

Carbon monoxide should not be present in a typical, indoor environment. If it *is* present, indoor carbon monoxide levels should be less than or equal to outdoor levels. Outdoor carbon monoxide concentrations on both days were ND (Tables 1 and 2). Carbon monoxide levels measured in the school were ND in all but two areas on both days (Tables 1 and 2). Measurable levels of carbon monoxide (1-3 ppm) were detected in the gymnasium and cafeteria on April 1, 2004 (Table 1). Carbon monoxide measurements in these areas were ND on the following day, which indicates a possible outdoor source (e.g., motor vehicle idling near the school). BEHA staff received complaints concerning vehicle exhaust odors in the office areas. M.G.L. chapter 90 section 16A prohibits the unnecessary operation of the engine of a motor vehicle for a foreseeable time in excess of five minutes (MGL. 1986).

Particulate Matter with a diameter of 2.5 micrometers or less (PM2.5)

Particulate matter is airborne solids that can be irritating to the eyes, nose and throat. The NAAQS originally established exposure limits to particulate matter with a diameter of 10 μm or less (PM10). According to the NAAQS, PM10 levels should not exceed 150 microgram per cubic meter ($\mu g/m^3$) in a 24-hour average (US EPA, 2000). These standards were adopted by both ASHRAE and BOCA. Since the issuance of the ASHRAE standard and BOCA Code, US EPA proposed a more protective standard for fine airborne particles. This more stringent, PM2.5 standards requires outdoor air particle levels be maintained below 65 $\mu g/m^3$ over a 24-hour average (US EPA, 2000). Although both the ASHRAE standard and BOCA Code adopted the PM10 standard for evaluating air quality, BEHA uses the more protective proposed PM2.5 standard for evaluating airborne particulate matter concentrations in the indoor environment.

Outdoor PM2.5 concentrations were measured at 6 $\mu g/m^3$ on April 1, 2004 (Table 1) and 7 $\mu g/m^3$ on April 2, 2004 (Table 2). All areas surveyed had PM2.5 levels that reflected outdoor levels. Frequently, indoor air levels of particulates (including PM2.5) can be at higher levels than those measured outdoors. A number of mechanical devices and/or activities that occur in schools can generate particulate during normal operations. Sources of indoor airborne particulates may include but are not limited to particles generated during the operation of fan belts in the HVAC system; use of photocopiers, fax machines and computer printing devices; operation of an ordinary vacuum cleaner and heavy foot traffic indoors.

Ultrafine Particles (UFPs)

The combustion of fossil fuels, welding, steel cutting, concrete/brick boring and other renovation activities can produce particulate matter that is of a small diameter (<0.02 µm). These UFPs can penetrate into the lungs and subsequently cause irritation. For this reason, a device that can measure particles of a diameter of 0.02 µm or less was used to identify potential pollutant sources.

The instrument used by BEHA staff to conduct air monitoring for UFPs counts the number of particles that are suspended in a cubic centimeter (cm^3) of air. This type of air monitoring is useful in that it can track and identify the source of airborne pollutants by counting the actual number of airborne particles. The source of particle production can be identified by moving the UFP counter through a building towards the highest measured concentration of airborne particles. Measured levels of particles/cm^3 of air increase as the UFP counter is moved closer to the source of particle production. This equipment can ascertain whether unusual sources of ultrafine particles exist in a building or whether particles are penetrating through spaces in doors or walls. It cannot be used to quantify whether the NAAQS PM2.5 standard was exceeded. For comparison, measurements were taken outdoors. Levels measured within the building were below or very close to outdoor levels and did not indicate an unusual source of ultrafine particles.

Other Concerns

A number of other conditions that can potentially affect indoor air quality were also observed. Latex gloves appeared to be used by the custodial staff (Picture 4). Use of latex gloves may introduce latex dust into the school environment. Some individuals are highly allergic to latex (e.g., spina bifida patients) (SBAA, 2001). It is recommended that the use of materials containing latex be limited in buildings to reduce the likelihood of symptoms in sensitive individuals (NIOSH, 1997). A question and answer sheet concerning latex allergy is attached as Appendix A (NIOSH, 1998). While the presence of latex containing materials can produce symptoms in sensitive individuals, it is unlikely to be a cause of the rashes observed on students during this assessment.

Finally, the use of individually purchased cleaning materials in the building was observed (Picture 5). Cleaning materials frequently contain ammonium compounds or sodium hypochlorite (bleach-products), which are alkaline materials. The use of these products can provide exposure opportunities for individuals to a number of chemicals, which can lead to irritation of the eyes, nose or respiratory tract. While the presence of alkaline cleaning products can produce symptoms in exposed hypersensitive individuals, it is unlikely to be the cause of the rashes observed among students during this assessment.

Conclusions/Recommendations

The rashes observed among students at the LJHS do not appear to originate from a common exposure to environmental conditions within the building or other materials commonly used at the school. Reports that symptoms had resolved in most students one week following the outbreak on April 1, 2004 would indicate that the skin rash was limited in nature. The sequence of events at the LJHS mirrors those of recent past outbreaks in schools, where the origin of the rash could not be determined (MMWR, 2002). Under these circumstances, BEHA staff would suggest that the students who reported rash be medically monitored by their health care provider if symptoms persist. If individuals continue to report symptoms after completion of the following recommendations, further consultation with an environmental/occupational physician may be prudent.

In view of the findings at the time of the assessment, BEHA recommends the following actions to improve general indoor air quality:

1. Use an alternative dust mop treatment that does not contain VOCs.
2. Reduce the use of cleaning materials that contain respiratory irritants (e.g. ammonia related compounds) on floors and in classrooms. Do not use these materials to disinfect equipment that comes into close human contact (e.g., telephones). Substitute plain soap and hot water for ammonia related cleaning

products. Cleaning products that contain ammonia should only be used where necessary. If ammonia containing cleaning products is used, rinse the area of application with water to remove residue.

3. For buildings in New England, periods of low relative humidity during the winter are often unavoidable. Therefore, scrupulous cleaning practices should be adopted to minimize common indoor air contaminants whose irritant effects can be enhanced when the relative humidity is low. To control for dusts, a high efficiency particulate arrestance (HEPA) filter equipped vacuum cleaner in conjunction with wet wiping of all surfaces is recommended. Drinking water during the day can help ease some symptoms associated with a dry environment (throat and sinus irritations).
4. Discontinue the use of latex gloves to prevent latex dust generation.
5. Identify and repair source of leak in the cafeteria/gymnasium hallway. Replace water damaged ceiling tiles. Examine the areas above and behind these areas for mold growth. Disinfect areas of water leaks with an appropriate antimicrobial.
6. Obtain wall-mounted digital carbon monoxide detectors for the cafetorium and gym.
7. Store cleaning products properly and out of reach of students.
8. Consider adopting the US EPA document, “Tools for Schools” (US EPA, 1992) as a means to maintaining a good indoor air quality environment in the building. This document can be downloaded from the Internet at http://www.epa.gov/iaq/schools/index.html.

9. Refer to the resource manual and other related indoor air quality documents for further building-wide evaluations and advice on maintaining public buildings. These materials are located on the MDPH's website: http://www.state.ma.us/dph/beha/iaq/iaqhome.htm.

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Picture 1

Classroom Univent with Cover Removed

Picture 2

Water Damaged Ceiling Tiles in Cafetorium/Gymnasium Hallway

Picture 3

Container of VOC-Containing Mop Head Treatment

Picture 4

Latex Gloves

Picture 5

Individually Purchased Cleaning Materials Removed from One Classroom

TABLE 1

Indoor Air Test Results – Lakeview Junior High School, Dracut, MA – April 1, 2004

Area	Carbon Dioxide (*ppm)	Temperature (^{o}F)	Relative Humidity (%)	Carbon Monoxide (*ppm)	PM2.5 $\mu g/m^3$
Outdoors	355	43	87	ND	6
211	375	70	33	ND	3
210	406	70	33	ND	3
215	414	70	34	ND	2
208A	371	68	35	ND	3
208	350	67	34	ND	1
204	375	68	35	ND	1
203	368	69	35	ND	1
Art Room	369	70	35	ND	1
Library	360	70	34	ND	1
221	370	69	33	ND	4
222	364	68	34	ND	4
220	385	68	34	ND	2
219	409	68	34	ND	2
221	401	69	34	ND	6
228	361	69	34	ND	1
227	377	69	34	ND	2
226	378	69	34	ND	1
229	363	68	35	ND	2
229A	398	69	34	ND	2
230	372	69	34	ND	1
225	377	69	34	ND	1
225A	342	69	34	ND	1
226	368	69	34	ND	1
122	392	69	34	ND	1
Cafetorium	350	70	33	1	ND
Gym	379	70	34	3	ND

- **ppm = parts per million parts of air**
- **ND = non-detectable**

TABLE 1

Indoor Air Test Results – Lakeview Junior High School, Dracut, MA – April 1, 2004

Area	Carbon Dioxide (*ppm)	Temperature (°F)	Relative Humidity (%)	Carbon Monoxide (*ppm)	PM2.5 µg/m³
109	377	68	35	ND	1
110	390	68	35	ND	1
108	365	67	33	ND	1
107	381	68	34	ND	1
105	362	68	34	ND	1
104	375	69	34	ND	1

- **ppm = parts per million parts of air**
- **ND = non-detectable**

TABLE 2

Indoor Air Test Results – Lakeview Junior High School, Dracut, MA – April 2, 2004

Area	Carbon Dioxide (*ppm)	Temperature (^oF)	Relative Humidity (%)	Carbon Monoxide (*ppm)	VOCs (*ppm)	PM2.5 $\mu g/m^3$	Ultrafine Particles (particle/cc)
Outdoors	326	47	93	ND	ND	7	5
Hallway 2nd Floor outside Library	424	69	30	ND	0.9	1	2
Library	377	69	29	ND	1.4	1	4
230	387	68	30	ND	0.9	2	3
229A	375	68	29	ND	0.9	2	2
229	370	67	29	ND	0.9	2	3
228	375	68	30	ND	0.9	1	4
227	374	68	30	ND	0.9	1	5
226	371	67	29	ND	0.9	3	4
225	365	68	30	ND	0.9	1	4
225A	393	69	30	ND	0.9	1	3
224	372	68	29	ND	0.9	3	2
219A	370	67	30	ND	0.9	3	2
223	362	67	31	ND	0.9	2	1
222	418	68	31	ND	0.9	3	1
221	384	68	31	ND	0.9	2	2
Storage Room 2nd Floor	376	68	32	ND	0.9	2	2
220	372	67	30	ND	0.9	2	2
219	363	67	32	ND	0.9	2	3
218 Art	375	67	31	ND	0.9	1	3
Assistant Principal Office	405	67	31	ND	0.9	2	4
214	361	67	30	ND	0.4	2	4
211	365	67	30	ND	0.4	2	4
215A	359	67	31	ND	0.4	2	4
216	354	67	30	ND	0.4	2	5

- **ppm = parts per million parts of air**
- **ND = non-detectable**
- **[a] resampling conducted three hours after initial round of sampling**

TABLE 2

Indoor Air Test Results – Lakeview Junior High School, Dracut, MA – April 2, 2004

Area	Carbon Dioxide (*ppm)	Temperature (^{o}F)	Relative Humidity (%)	Carbon Monoxide (*ppm)	VOCs (*ppm)	PM2.5 $\mu g/m^3$	Ultrafine Particles (particle/cc)
209	351	67	30	ND	0.4	2	3
208	363	67	31	ND	ND	2	5
208A	358	66	31	ND	ND	2	3
207	360	66	32	ND	0.4	2	5
206	323	66	32	ND	0.4	2	4
205	321	67	32	ND	0.4	2	3
204	354	67	32	ND	0.4	2	3
Main Office	429	67	32	ND	0.4	3	4
105	377	69	30	ND	0.4	7	4
104	381	69	30	ND	ND	3	3
103	381	69	31	ND	ND	4	3
106	381	69	31	ND	ND	3	3
103A	378	70	31	ND	ND	3	3
107	370	69	31	ND	ND	3	5
107A	361	69	31	ND	ND	3	3
108	369	68	32	ND	ND	3	3
113	405	69	31	ND	ND	8	4
112A Storeroom	430	69	33	ND	1.4	2	4
112	387	68	32	ND	0.4	2	2
109	365	68	32	ND	0.4	2	4
110	365	68	32	ND	0.4	2	5
111	385	68	32	ND	0.4	2	3
Boiler Room Hallway	389	67	33	ND	ND	2	6
Gym	363	68	31	ND	ND	1	5
Cafetorium	408	69	31	ND	ND	1	2
Music 121	349	68	29	ND	ND	2	2

- **ppm = parts per million parts of air**
- **ND = non-detectable**
- **[a] resampling conducted three hours after initial round of sampling**

TABLE 2

Indoor Air Test Results – Lakeview Junior High School, Dracut, MA – April 2, 2004

Area	Carbon Dioxide (*ppm)	Temperature (^{o}F)	Relative Humidity (%)	Carbon Monoxide (*ppm)	VOCs (*ppm)	PM2.5 $\mu g/m^3$	Ultrafine Particles (particle/cc)
Chorus-Back Stage Area	358	68	30	ND	ND	1	2
122	368	68	31	ND	ND	4	3
Custodian F	383	68	31	ND	ND	2	3
123	371	68	31	ND	ND	4	3
124	369	68	31	ND	ND	3	2
120	372	68	32	ND	ND	4	3
119	391	68	37	ND	ND	4	2
125	374	68	31	ND	ND	4	2
119A	372	68	31	ND	ND	4	2
126	370	69	31	ND	ND	3	3
118	350	67	30	ND	ND	6	4
126A	364	68	31	ND	ND	5	3
127	367	68	31	ND	ND	4	3
Public Library	367	68	31	ND	ND	5	3
226 VOC resample[a]					ND		
222 VOC resample[a]					ND		
218 VOC resample[a]					ND		
Library Hallway VOC resample[a]					ND		
214 VOC resample[a]					ND		
211 VOC resample[a]					ND		
215					ND		

- **ppm = parts per million parts of air**
- **ND = non-detectable**
- **[a] resampling conducted three hours after initial round of sampling**

TABLE 2

Indoor Air Test Results – Lakeview Junior High School, Dracut, MA – April 2, 2004

Area	Carbon Dioxide (*ppm)	Temperature (°F)	Relative Humidity (%)	Carbon Monoxide (*ppm)	VOCs (*ppm)	PM2.5 µg/m³	Ultrafine Particles (particle/cc)
VOC resample[a]							
209 VOC resample[a]					ND		

- **ppm = parts per million parts of air**
- **ND = non-detectable**
- **[a] resampling conducted three hours after initial round of sampling**